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SOURCE Stanki i instrument, No 8, 1950.

## NEW KNEE-TYPE MILLING MACHINES IN THE USSR

S. M. Benin

1. An increase in speed, rigidity, and power to such a degree as to make possible the full utilization of tools with hard-alloy blades and tools of new edge geometry.

2. A decrease in the number of control mechanisms and their concentration within easy reach of the operator.

3. The largest possible introduction of multitool and multiposition designs permitting simultaneous tool performance which will shorten the machining cycle.

4. Making automatic the starting and stopping of feed, advancing and withdrawing of the cutting tool and from working position, securing the blank in the machine tool before starting work, etc.

5. The introduction of automatic transfer machine-tool lines when economically expedient.

6. Shortening kinematic chains to the minimum and perfecting drive elements.

7. Extending the useful life of machine tools by increasing wear resistance, perfecting lubrication, improving the crushing and removing of chips, making electric motors and built-in mechanisms readily accessible, shortening the time required for repairs, etc.

8. Improving the external design of machine tools.

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Several years ago, there was a discrepancy between hard-alloy tool possibilities and machine-tool potentials. The spindle and feed speeds, and the power and rigidity of machine tools were inadequate for working at speeds permitted by the hard-alloy tools. This disproportion was eliminated by:

1. Modernization of the existing park of the more common general-purpose machine tools, and organization of the production of modernized machine tools with considerably increased speeds.

2. Organization of the production of new-design machine tools which would meet the needs of high-speed machining. The new machine tools would replace obsolete models.

Among the many new types of machine tools which are ready for series production are nine new models of knee-type milling machines:

a. Model numbers ending in 0: 6P80, 6P80G, and 6P10. These will replace models 680, 680G, and 610.

b. Model numbers ending in 1: 6N81, 6N81G, and 6N11. These were not manufactured earlier.

c. Model numbers ending in 2: 6N82, 6N82G, and 6N12. These will replace 6B82, 6B82G, and 6B12.

d. Model numbers ending in 3: 6N83, 6N83G and 6N13. These will replace models 683, 683G, and 615.

The following table shows comparative data on new and old machine tools:

New Model Earlier Model	Rpm	Feed, mm/min	Power, kw	Weight, kg
6N80 680	50-2,240 47.6-530	28-1,250 19-420	32.2+1.0 2.2+0.35	1,600 940
Percent of increase	325	200	64	71
6N82 6B82	30-1,500 35-750	19-950 20-700	5.8+2.2 4.3+1.5	2,900 2,000
Percent of increase	100	35	38	45
6N83 683	30-1,500 20-500	23.5-1,180 14-508	7.8+2.2 8.2	4,100 3,700
Percent of increase	200	130	22	11

#### Design of Models 6P80, 6P80G and 6P10

These machine tools were designed by M. B. Paley, A. F. Mushtayev, N. N. Ognev, F. F. Rakhmanov, V. S. Belov, G. A. Monakhov, S. S. Rumyantsev, and Ye. S. Levanova, under the direction of S. S. Chernikov.

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The No 0 knee-type milling machines have an 800 x 200-millimeter table. Model 6P80 is a universal milling machine; 6P80G, horizontal; and 6P10, vertical. The universal machine differs from the horizontal only in that it has a rotary table which can be swivelled at  $\pm 45$  degrees.

The column of the machine tools is solid casting with square ways for carrying the knee. The knee supports a saddle and working table. The table travels in a longitudinal direction on dovetail-shaped saddle ways in a transverse direction (together with the saddle) on the knee ways. The transmission is enclosed in the column.

Spindle speeds are controlled by a hand lever on the left side of the column.

The spindle and reducing gear are mounted in the upper part of the column. A 3.2-kilowatt independent motor drives the spindle which revolves from 50 to 2,240 revolutions per minute through a V-belt drive.

The top of the column has ways in the shape of dovetails on which the arbor support slides. One or two suspension arms for holding the milling arbor are attached to the arbor support. The end of the arbor support is held by a harness.

The feed box is located to the left of the knee. There are 12 feeds. The rates of feed range from 28 to 1,250 millimeters per minute. An 0.65-kilowatt motor drives the feed through a separate box located to the right of the knee. Feed change is selected by means of a single hand lever.

The knee is secured to the column by means of a hydraulic device which simultaneously activates two clamps located in the upper part. The bottom of the column is fastened firmly to the base by bolts. The base also holds the vertical screw for carrying the knee on the column and a lubricant-coolant pump. The tank for the coolant is contained within the base.

The electrical equipment of the machine tool is recessed in the column and permits operation with either power or hand feed. The electrical system of the machine tool includes a block-signal system which makes impossible the change of spindle speeds while the spindle is in motion, thus avoiding gear breakage. Terminal switches have been installed for controlling cross and vertical travel.

Lubrication of all mechanisms of the machine tool is forced under pressure from four plunger pumps disposed in the gear box, knee, and saddle.

The coolant-pump supply line is laid inside the column, emerges only at the top, and ends with a flexible return hose and nozzle. The liquid drains through canals in the saddle and knee. With the exception of the column, the mechanisms of the 6P10 vertical machine are interchangeable with the horizontal model. The column is a solid casting, equipped with longitudinal ways on which the knee slides. It has a vertical bore on top in which the spindle and reducing gear are mounted.

The gear box and electric motor in the rear of the machine, and the spindle transmission (a vertical shaft and belt drive) are all-enclosed, giving the machine tool a good-looking external appearance.

Note: "konsol'no-frezernyy stanok" has previously been translated as "cantilever milling machine" or "bracket milling machine." It is clear from this article that "konsol'nyy" means "knee-type" milling machine.

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An inconsistency appears to exist in this article. The text of the article indicates that the Model 680 will be replaced by the 6P80, whereas the table lists its replacement as 6N80.

It is interesting to note that in the January 1949 issue of Stanki i instrument, it was stated that Models 6N82, 6N82G and 6N12 were ready for series production. The same comment is now being repeated here 19 months later. Models 6N83 and 6N13 were also mentioned in

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This article is to be continued in a later edition of Stanki i instrument.

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